

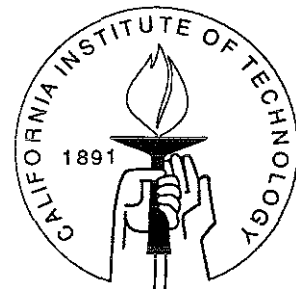
DIVISION OF THE HUMANITIES AND SOCIAL SCIENCES  
**CALIFORNIA INSTITUTE OF TECHNOLOGY**

PASADENA, CALIFORNIA 91125

TESTING DIVIDEND SIGNALLING MODELS

Dan Bernhardt  
Queen's University  
California Institute of Technology

J. Fiona Robertson  
Seattle University



**SOCIAL SCIENCE WORKING PAPER 828**

March 1993

# TESTING DIVIDEND SIGNALLING MODELS

Dan Bernhardt

J. Fiona Robertson\*

## Abstract

This paper derives a key monotonicity property common to all dividend signalling models: the greater the rate that dividend income is taxed relative to capital gains income, the greater the value of information revealed by a given dividend, and hence the greater the associated excess return. This monotonicity condition is tested with robust non-parametric techniques. No evidence is found to support dividend signalling models. The same results are inconsistent with tax-based CAPM arguments.

---

\*We are very grateful to Ray Farrow for his extensive help on the first three sections of the paper and for the very generous provision of his time to this project. We also appreciate Jeff Strnad's comments and suggestions. The first author acknowledges support from the SSHRC. All errors remain our own.

## TESTING DIVIDEND SIGNALLING MODELS

Dan Bernhardt and J. Fiona Robertson

### I Introduction.

Since the publication of Ross (1977) and Bhattacharya (1979), financial economists have explored the possible signalling properties of dividends and other financial activities. Research into the signalling properties of dividends has been motivated by an attempt to explain the apparent excess returns observed following announcements by firms of favorable dividends. Building on the work of Spence (1973), Bhattacharya (1979) produced an internally consistent model of Modigliani and Miller's (1963) "informational content of dividends hypothesis", demonstrating how dividends could allow insiders to credibly communicate information about the expected future value of the firm to less informed outsiders.<sup>1</sup> Credibility of the signal requires that it not pay low quality firms to mimic the behavior of high quality firms.

The majority of the empirical studies of the "information content of dividends hypothesis" have used an event study methodology to investigate the response of share prices to the announcement of changes in dividend levels.<sup>2</sup> Many of these papers found evidence supportive of the view that there appears to be a stock price response to changes in firms' dividend policies (Aharony and Swary (1980), Asquith and Mullins (1983), Brickley (1983), Charest (1978), Fama, Fischer, Jensen and Roll (1969), Ghosh and Woolridge (1988), Kalay (1980), Kalay and Lowenstein (1986), Laub (1976), Patell and Wolfson (1984), Pettit (1972) (1976)). Such results have been viewed as supportive of the view that dividend announcements are interpreted by the market as being informative of firm value. A few early studies focused on examining the predictive content of dividend policy for future share performance, rather than investigating the existence of an announcement effect, and found less evidence to support the view that dividend announcements convey additional information to the market (Ang (1975), Gonedes (1978), Penman (1983), Watts (1973), (1978)).

-----  
<sup>1</sup>Credibility of the signals here refers to the recognition that the signalling aspect of financial policy must be immune to the possibility that insiders could strategically manipulate the signals sent in such a way as to allow them to benefit from temporary mispricing of the firm's shares.

<sup>2</sup>Notable exceptions are Kalay (1982), John and Mishra (1990), and John and Lang (1991), which are discussed below.

Eades (1982) takes a different approach to testing dividend signalling models. Rather than trying to detect the presence of an announcement effect from dividend changes or examine the predictive content of dividend policy, Eades derives and tests specific predictions obtained from comparative static analysis of a formal dividend signalling model.<sup>3</sup> Eades analyzes a version of Bhattacharya's signalling model and derives two testable hypotheses: (1) an inverse relationship between dividend yield and a firm's own variance of returns; and (2) the "relative signalling strength hypothesis" (RSS) which states that "higher risk firms exhibit stronger changes in value relative to their lower risk counterparts for any given change in dividends" (p. 473). Eades finds empirical support for the first of these results but strongly rejects the RSS hypothesis.

This paper's test of signalling theories of dividends is in the spirit of Eades in that we derive and test a comparative static result derived from dividend signalling models. The RSS hypothesis tested by Eades was derived from a particular model of dividend signalling with particular specifications of functional forms and distributional assumptions within that model. In contrast we test a non-parametric comparative static result that holds for any dividend signalling model, rather than a comparative static derived from a particular example of such a model.

We argue that a testable hypothesis that can be derived within the context of *any* signalling theory of dividends is that there is a monotonic relationship between the marginal tax rate on dividend income relative to capital gains and the amount of "good news" revealed by any sized dividend. The higher is the relative tax rate on dividends the better is the "type" revealed by any level of dividend yield, and hence, under rational expectations, the greater the associated excess return. It is important to note that this result holds *whether or not* the underlying signalling argument is tax based.

---

<sup>3</sup> John and Mishra also derive comparative statics from an explicit signalling model. They allude to empirical evidence from other researchers consistent with their predictions. John and Lang (1991) derive testable implications from a specific signalling model regarding correlations between the announcement of dividend changes, the extent of insider trade and the response of stock prices. They find weak empirical supporting results.

This observation suggests a simple and robust method for testing all signalling theories of dividends. Over the period 1962–1988 there have been numerous changes in the US Federal tax code governing the taxation of dividend income and capital gains in the US. We identify 16 distinct tax regimes and order them from most favorable to dividend income relative to capital gains income, to least favorable. Signalling theories predict that for a *given* dividend yield, the good news released, and hence the associated excess return, should be least when dividend income receives the most favorable tax treatment, and the excess return should be greatest when dividend income receives the least favorable tax treatment. We refer to this as the monotonicity property of signalling models. It is important to note that we can distinguish between whether information is released as an indirect by-product of dividend announcements (e.g. higher dividends reveal more cash on hand) and whether information is released as a result of signalling. The former hypothesis predicts that information release should be positive, but independent of the tax regime.

Since a generic dividend signalling model does not predict a particular functional form for the relationship between tax rates and excess returns for a given dividend yield, we test this monotonicity relationship without imposing particular parametric restrictions. In particular we employ non-parametric tests of rank order correlation (Kendall's tau and Heoffding's distribution free tests) to test for the predicted monotonic relationship. The advantage of these tests is that they are robust, they allow us to control for the dividend yield levels, and we do not have to worry about misspecifying the functional form.

We find no evidence of correlation between the relative tax treatment of dividends and the excess returns earned following dividend announcements (controlling for the size of the dividend payout and firm size). We thus find no evidence to support the view that dividends act as a signal of firm value. More precisely, the paper provides strong evidence against the joint hypothesis that the marginal investor is taxed and that dividend yield serves as a signal of firm value. Peterson, Peterson and Ang (1985) examine income tax returns and estimate a marginal effective tax rate on dividend income of 30% for 1979, suggesting that the marginal investor is taxed.

This evidence is also inconsistent with the tax-based CAPM models of

Brennan (1979) and Litzenberger and Ramaswamy (1979, 1980, 1983). In these models investors demand compensation in the form of higher pre-tax returns on high dividend stocks to compensate for the higher tax cost of dividends relative to capital gains; higher dividend taxes raise the required pre-tax return.<sup>4</sup>

Section 2 derives in a general context the monotonicity property that is the basis for our test. Section 3 examines the theoretic literature on dividend signalling, identifying that the monotonicity property holds in each paper. Section 4 explains the various tax code changes that have occurred in the treatment of capital gains taxes in the U.S. over the period 1960-1988. Section 5 explains the data to be employed and section 6 explains the non-parametric tests employed. Section 7 contains results, following which section 8 discusses the results and draws conclusions.

## II. A General Signalling Theory.

The essential relationship that we wish to test is a key comparative static that holds for *any* dividend signalling model. This result holds that the level of dividend payout needed to signal any given level of hidden firm characteristic is lower the higher the marginal tax rate on dividend income relative to capital gains. The simple intuition behind this result is that any signalling model implies selecting an optimal level of dividend payout by equating the marginal cost of the signal level to the marginal benefit of the signal level. The marginal cost of the signal (dividend payout) is a strictly increasing function of the marginal tax rate on dividends and a decreasing function of the marginal tax rate on capital gains. This monotonic relationship holds whether or not the signalling aspect of dividends derives from the tax rate. Since the marginal benefit of the signal is independent of the tax rate, we obtain the predicted inverse relationship between dividend payout levels and dividend tax rates for any quality of firm that signals -- any given amount of good news can be signalled with a lower dividend level if the marginal cost of dividend payouts is higher.

Consider the following description of a general (scalar) dividend

-----  
<sup>4</sup>A recent study by Christie and Huang (1992) focuses on the tax effect of dividends across tax regimes.

signalling model. Let  $D$  denote the dividend (signal) level,  $P$  denote the market price of a firm's shares, and  $\theta$  denote some characteristic known only to the informed manager(s) of the firm.  $\theta$  is the variable to be signalled to the uninformed. The informed's welfare depends on both the current share price and the true value of the firm.<sup>5</sup> Denote this relationship  $V(P, \theta)$ . Note that  $\partial V / \partial P > 0$ . In a signalling equilibrium  $P$  depends monotonically<sup>6</sup> on  $D$ ,  $P(D)$  with  $P' > 0$ , so that we can write  $V(P(D), \theta)$ .

There is some cost associated with sending the signal (issuing dividends). Part of this cost is the tax cost, denoted  $\tau D$ . In order for a signalling equilibrium to exist, we also require that the marginal cost of dividend issuance depends on the type of the firm. Hence we write the total cost of dividends as  $C(D, \theta) + \tau D$  (or more generally as  $C(D, \tau, \theta)$ , where  $\partial C / \partial D > 0$ ,  $dC / d\tau > 0$ ,  $\partial^2 C / \partial D \partial \tau > 0$ ).

The informed choose  $D$  in order to maximize  $V(P(D), \theta) - C(D, \tau, \theta)$ , taking account of the dependence of  $P$  on  $D$ . In a signalling equilibrium  $P(D)$  must be "informationally consistent" (Riley, 1979), requiring that  $P(D) = \Pi(\theta, D)$ , where  $\Pi(\cdot)$  denotes the "true" market value of a firm of type  $\theta$  paying out a dividend of  $D$ , and  $\partial \Pi / \partial \theta > 0$  so that higher values of  $\theta$  correspond to higher quality firms. An optimal signalling equilibrium requires selecting the level  $D^*$  that solves:

$$\max_D V(P(D), \theta) - C(D, \tau, \theta), \quad (1)$$

where  $P(D) = \Pi(\theta, D)$ .

As Riley shows, two necessary and sufficient conditions for the existence of a solution to (1) with  $P(D) \neq \bar{P}$  (i.e. that involves signalling) are:

- (1) The existence of a finite  $\hat{D}$  that maximizes firm value absent

-----  
<sup>5</sup>This is a critical characteristic of all dividend signalling models. Absent a dependence on current share price, the insiders would have no incentive to signal firm value to outsiders since they would not benefit from the transmission of information. Absent some concern for future share value (once the truth becomes known to all) the insiders always wish to raise current share price by signalling good news, unconcerned about the future impact of their false signal, so that no credible signal can emerge.

<sup>6</sup>The monotonicity of  $P(D)$  follows from the results of Mailath (1987).

any signalling effects.<sup>7</sup>

(2) The "single-crossing property":

$$\frac{\partial}{\partial \theta} \left( \frac{\partial C(D, \tau, \theta) / \partial D}{\partial V(P(D), \theta) / \partial P} \right) < 0 \quad \text{for all } \theta. \quad (2)$$

Note that absent dividend taxes the Modigliani-Miller (1968) conditions violate condition 1, since under MM any level of dividend is optimal absent signalling effects. The existence of a positive tax differential on dividends versus capital gains ensures that condition 1 is satisfied since the optimal dividend level absent signalling is then equal to zero. Note too, that if there are no direct benefits to the signalling activity that depend on  $\theta$ ,<sup>8</sup> then condition (2) reduces to  $\partial^2 C / \partial D \partial \theta < 0$ ; marginal signalling costs must be inversely related to firm quality.

Solving the first order conditions (FOC) for problem (1), we obtain

$$\frac{\partial V(P(D), \theta)}{\partial P} \frac{\partial \Pi(\theta, D)}{\partial \theta} \frac{d\theta}{dD} + \frac{\partial V(P(D), \theta)}{\partial P} \frac{\partial \Pi(\theta, D)}{\partial D} = \frac{\partial C(D, \theta, \tau)}{\partial D},$$

or, for the special case where  $C(D, \tau, \theta) = C(D, \theta) + \tau D$ ,

$$\frac{\partial V(P(D), \theta)}{\partial P} \frac{\partial \Pi(\theta, D)}{\partial \theta} \frac{d\theta}{dD} + \frac{\partial V(P(D), \theta)}{\partial P} \frac{\partial \Pi(\theta, D)}{\partial D} = \frac{\partial C(D, \theta)}{\partial D} + \tau.$$

This FOC characterizes a differential equation for the optimal signalling function  $D(\theta)$ . Infinitely many solutions to this FOC exist. Identification of a particular signalling equilibrium is typically achieved by identifying the most efficient of all the solutions to the differential equation. An early justification for this procedure can be found in Riley (1979). Cho and Kreps (1987), and Banks and Sobel (1987) present equilibrium refinements that identify these equilibria in most signalling games. In the presence of dissipative signals (such as dividend taxes), this selection procedure identifies the solution in which the lowest quality firm selects a zero dividend. We should emphasize, though, that our empirical analysis is robust

---

<sup>7</sup>This is needed to prevent all firms from setting  $D$  at such a high level that it is impossible to have any information transmitted.

<sup>8</sup>This occurs for instance in Spence's signalling model where education adds no value but simply acts as a dissipative signal.



to the particular equilibrium selection, provided that the same equilibrium is selected over time.

To derive the impact of changes in dividend taxes on the optimal dividend payout level for any quality of firm, we carry out the comparative static:

$$dD^*/d\tau = V_p \Pi_{DD} \theta' + V_p \Pi_{DD} - C_{DD} < 0 \text{ from SOC.} \quad (3)$$

An increase in marginal tax rate,  $\tau$ , leads the level of the dividend,  $D$ , to be set at a point where the net marginal benefit is higher, which, by second order conditions, ensures that  $dD^*/d\tau < 0$ .

Notice that in the absence of some direct benefit of dividends, dividend taxes alone do not satisfy the single-crossing property (2) since  $\partial^2 C / \partial \tau \partial \theta = 0$ . Thus, if dividends are to act as a signal in a scalar signalling model, some other aspect of dividend costs must generate the needed relationship between marginal dividend costs and firm quality that provides separation (this is not true in vector signalling models because property (2) is not required for multiple signals). However, *even* if dividend taxes are *not* the feature of the model that generates single-crossing, equation (3) shows that the optimal dividend level still depends on  $\tau$ .<sup>9</sup>

To derive the monotonicity condition in a multiple signalling model, note that with multiple signals the firm chooses the most efficient (cost-minimizing) mix of signals. The cost-minimizing mix of signals is determined where the marginal cost of each signal is equated across all signals used. An increase in the marginal cost of one signal (as would occur with an increase in the tax on dividend payouts) leads to an equilibrium in which the mix of signals is altered so that less signalling is done with the relatively more expensive dividend signal.

### 3a. Monotonicity in Scalar Signalling Models.

Early signalling models (Bhattacharya (1979), Kalay (1980), Talmor

---

<sup>9</sup>Bhattacharya's (1979) model demonstrated this key fact since this model contained both dividend taxes that did not satisfy condition (2) and an outside financing cost that did satisfy (2), so that the presence of dividend taxes was not the feature of the model that drove the ability of dividends to act as a signal: even absent dividend taxes, dividends acted as a signal. Within this framework Bhattacharya shows that the optimal dividend level depends on  $\tau$ .

(1982), Hakanson (1982), Miller and Rock (1985), and Bar Yosef and Hoffman (1986)) seek to explain both the dividend payout and their informational content. These papers apply Spence's (1973) general signalling theory to the case of dividends. Dividend payments by firms act as a signal of either current or expected firm value. The models differ in two regards, the form of dividend cost function,  $C(D, \tau, \theta)$ , and the motivation behind why the informed's objective function is of the form  $V(P(D), \theta)$  rather than being concerned solely with  $P(D)$  (current value) or solely with future value.

Bhattacharya (1979), Kalay (1980), Talmor (1982), Hakanson (1982), and Bar Yosef and Hoffman (1986) assume that the cost of dividend issuance arises due to the corporate transaction costs of refinancing cash shortfalls. In Kalay this is due to the assumed managerial reward scheme which punishes managers for refinancing cash shortfalls; in the other papers the cost is an external financing penalty. In Miller and Rock, the cost associated with the issuance of dividends arises from the cost of foregone investment projects that could have been financed with the funds used to issue dividends.

To motivate the form of objective function it is either assumed that the form of managerial reward scheme produces a concern for both current and true value or that managers act in the interests of current firm shareholders whose time horizon is such that they care about both current share prices and future share prices.

Kalay (1980), Talmor (1982), Hakanson (1982), and Bar Yosef and Hoffman (1986) present extensions, variations and special cases of Bhattacharya's initial 1979 paper. Informed managers know the cash flow distribution of their firm. The possible cash flow distributions can be ordered according to first order stochastic dominance so that there is a well defined notion of firm quality. Assuming that making up future cash shortfalls from external financing is costly to the informed and that firms are committed to always paying out promised dividends in full, informed managers maximize an objective function that is a weighted average of the current stock price and the *ex post* (after cash flows are realized) stock price. In this scenario managers of high quality firms pay a dividend just high enough to distinguish themselves from the low quality firms, which are discouraged from mimicking the behavior of the high quality firm by the greater probability of having to turn to costly external financing to pay the dividend given their lower expected cash flow. The benefit of paying a dividend is the same for both types of firm

(the positive current stock price return) but the cost is higher for a low quality firm because they are more likely to have to resort to external finance. These models explicitly contain a differential tax on dividend payouts and derive comparative statics results demonstrating that dividend payout levels are a decreasing function of tax levels.

Miller and Rock assume that the level of investment spending by the firm is determined as a residual after dividend payout.<sup>10</sup> Outsiders know everything about the firm except for the current cash flow level which is assumed to be correlated with the profitability of investment. The level of investment undertaken by the firm can then be inferred from the level of cash payout and knowledge of the firm's sources and uses of funds statement. The resulting signalling cost emerges from the diversion of potential investment funds to pay dividends, because underinvestment is more costly on the margin for less profitable firms. If we add a tax on cash distributions at rate  $\tau$ , then the equation relating the inferred firm quality,  $X$ , to dividend payout,  $D$ , is

$$X'(D) = (\tau - 1) \left[ \frac{F'(X-D) - (1+i)}{kF'(X-D) + k\gamma} \right],$$

where  $F'$  is the marginal productivity of investment,  $\gamma$  measures the correlation between current and future earnings,  $i$  is the discount rate and  $k$  is the fraction of shares sold to outsiders. This shows that for any dividend  $D$ , the implied firm quality  $X$  is larger the higher is  $\tau$ , so that the higher is  $\tau$ , the lower is the dividend necessary to signal any given firm quality.

### 3b. Monotonicity in Vector (Multiple) Signal Models.

While the early signalling literature built on the results of Spence, with exogenously specified signalling variables, more recent work has analyzed multiple signalling models. These models address two criticisms of the earlier work: (1) The early papers "explain cash payout more satisfactorily than they explain the choice between dividends and repurchases" (Bagwell and Shoven (1989)). (2) Dividends may be capable of acting as a signal of share value but appear to be a very expensive form of signal. Can dividends still play a signalling role in an equilibrium where firms optimally choose how to signal once we allow for other, possible cheaper, signals to exist?

---

<sup>10</sup> This is in marked contrast to the Fisherian aspect of the MM result.

An early contribution to the general theory of multiple signalling models was Engers (1987) who establishes results analogous to Spence's single crossing property for multiple signal models. An important aspect of Engers' condition is that only a certain quasi-concavity condition on the signalling cost function is required. In particular, it is not required that all signals satisfy the single-crossing property individually. One important case that satisfies Engers' condition arises when there are two signals and the cost of one satisfies single crossing and the cost of the other is linear in the signal level. This is important since it means that as long as the other signal exhibits increasing marginal cost with quality, that dividends can act as a signal even if the only cost of dividends is the (linear) tax cost.

John and Williams (1985) address specifically the question of how firms choose between stock repurchases and dividend payouts in the presence of differential dividend taxes. Exogenous demands for liquidity by shareholders and by the firm to finance activity are assumed. Shareholders wish to avoid dilution of ownership that occurs if they meet their liquidity needs by selling shares. In equilibrium the firm meets these liquidity demands by making cash disbursements in the form of dividends or share repurchases. Dividend payouts are subject to a tax cost while repurchases (or share sales to generate liquidity) are costly due to their impact on the ownership share of current shareholders. This dilution is more costly the more profitable the firm, so the informed managers, acting in the interests of current shareholders, may distribute a taxable dividend if outsiders realize that this signals high expected profits and so re-price outstanding shares appropriately (allowing the firm to raise needed capital with the issuance of less new shares, further reducing dilution of ownership). Dividend payouts thus substitute for having to sell shares with the associated dilution cost. The gain from avoiding this dilution cost outweighs the tax disadvantage of dividends, so that the cost minimizing mix of signals requires some dividend payout. The optimal mix of signals occurs where these marginal costs are equated across payout methods, so that the optimal dividend payout for any quality of firm "decreases in the personal tax rate" (p 1063).

Ofer and Thakor (1987) also analyze the simultaneous use of stock repurchases and dividends as signals (in the context of no dividend taxes). Cash disbursements are costly due to the potential need for costly external financing (as in Bhattacharya). The relative cost of the two signals differ

due to an assumption of risk aversion on the part of the informed owner/managers and differences in the risk exposure characteristics of the two signals. Dividend payouts accrue to all shareholders (including the owner/managers), while it is assumed that the owner/managers are excluded from participation in share repurchases to prevent them from falsely signalling and then selling out at the incorrectly inflated price. In equilibrium, the higher the true value of the firm, the greater the share of the signalling that is carried out using repurchases. Even though differential taxes are not considered in this analysis, Ofer and Thakor indicate that including taxes would alter their results only by lowering the critical firm value below which only dividends are used. The key non-mimicry condition -- "the size of the dividend payout is just large enough to persuade the [low quality] firm not to mimic" (p 374)) -- can be easily altered to allow for differential taxes. The benefit of mimicry (being thought high quality) is independent of the tax rate, while the cost of mimicry is raised by a higher dividend tax, so that it takes a lower dividend level to achieve separation with a higher tax rate. Thus, the analysis of Ofer and Thakor satisfies our monotonicity condition.

Ambirush, John and Williams (AJW) (1987), and Williams (1988) present models that combine the cash disbursement cost of Miller and Rock with John and Williams' relative cost structure for dividends and repurchases to determine the form of cash disbursement used. Williams extends AJW to the case of a continuum of types under slightly more restrictive assumptions. These papers address the difficulty in interpreting Miller and Rock's analysis in the case of a differential dividend tax by explicitly treating share repurchases and dividends as distinct payout methods. As in John and Williams the difference in the costs of these payout methods derives from the tax cost of dividends versus the dilution cost of repurchases. In common with Miller and Rock is the fact that the cost of cash disbursements is due to the implied underinvestment resulting from the diversion of funds to cash distributions. AJW do not explicitly derive a comparative static relating to changes in the dividend tax rate, but Williams does. Williams explicitly solves for the optimal dividend function and shows that  $dD/d\tau < 0$  for all but the lowest quality firm (which sets  $D = 0$ ).<sup>11</sup>

---

<sup>11</sup> Examination of figures (1) and (2) in AJW reveals that the monotonicity property holds. The slope of the maximand is flattened by higher dividend

John and Mishra (1990), and John and Lang (1991) study how dividend announcements, when combined with insider trades, can signal firm quality. The cost of dividends as a signal results from underinvestment (as in Miller and Rock). Once again, even though the analysis does not rely on dividend taxes, an increase in the marginal cost of signalling with dividends (a higher tax rate) alters the optimal mix of signals so that more signalling is done with insider trades and less with dividends if dividends become a more costly way to signal.

Kumar (1988) considers a model where due to differences in risk aversion between the informed owner/manager and the uninformed shareholders, there is a conflict of interest between these agents in determining the optimal investment level of the firm. An informational asymmetry arises because managerial productivity is not known by the outside shareholders. Dividends are untaxed. Kumar shows that while there is no fully-separating equilibrium via dividend signals, a coarse signalling (or semi-separating) equilibrium exists in which dividend levels partition managerial productivity, allowing investment to at least partially reflect productivity. Once again, even though Kumar does not include any dividend taxes in his model, examination of his non-mimicry argument reveals that a higher dividend tax rate, other things equal, makes it easier to satisfy the required non-mimicry condition, so that the model satisfies the monotonicity property.

Finally, Bernheim (1991) develops a tax-based theory of dividend signals to determine the optimal mix of dividends and share repurchases. Higher payout levels are costly since they expose the firm to the risk of requiring costly external financing. Bernheim adds to Bhattacharya's analysis the possibility that firms can avoid costly external financing via bankruptcy. The possibility of bankruptcy prevents the diminishing marginal cost of cash disbursements (the single-crossing property in Bhattacharya) from holding globally since, with the possibility of avoiding external financing by declaring bankruptcy, for very large disbursements the marginal cost of disbursements is actually higher for high quality firms. This follows since low quality firms are already at the point of bankruptcy so the marginal cost

-----  
taxes while the slope of the non-mimicry constraint is not altered, giving a tangency at a lower level of dividend payout as the tax rate is raised.

to them of additional cash distributions is close to zero, while high quality firms are operating below the point of bankruptcy and so are still facing a positive marginal cost of outside financing. Hence, disbursements of a certain size can act as a signal of firm quality, but if the difference in firm quality is large, raising distributions beyond a certain point may not help separate out different quality firms. It is here that issuing taxable dividends helps achieve separation. A high quality firm can issue disbursements up to the point where the marginal cost of disbursements no longer satisfies the necessary single-crossing property. Beyond this point the firm issues dividends and issues new equity (so that total cash distributions are not raised). Taxes prevent the low quality firm from wishing to mimic this policy. As Bernheim demonstrates "an increase in the tax rate of dividends reduces both dividends and new equity issues" (page 468). Hence once again, our key monotonicity property holds.

#### **4 Tax Treatment of Dividends and Capital Gains, 1962-1988.**

The Tax Reform Act of 1986, the U.S. Federal tax code applied the same personal income tax rate to long-term capital gains and ordinary income (including dividend income). This was the first time since 1921 that the income tax code has not discriminated against dividend income relative to capital gains income.<sup>12</sup> While this change may have been the most dramatic change in the relative treatment of capital gains versus ordinary income, numerous changes in the tax code over the last three decades have also affected the relative tax treatment of capital gains and other income.

Prior to the Tax Reform Act, 50 percent or more of capital gains were excludable from taxable income, reducing the effective tax rate on capital gains below that on other forms of income. Over the period 1960-1986 numerous changes in income tax rates, tax brackets, exclusion allowances, changes in maximum alternative tax rates, changes in the definitions of long-term capital gains, and changes in deductibility allowances for capital losses, have changed the effective tax disadvantage of dividends relative to capital gains.

---

<sup>12</sup>It is still the case that dividend-paying equity is subject to two levels of taxation, first at the corporate income tax rate and then at the personal income tax rate (at least for shareholders subject to personal taxes such as households).

At present, the top tax rate on capital gains is 28 percent (the same as on all income). Throughout most of the 1960s this rate was 25 percent. In the mid-1970s rates rose dramatically for high income earners, so that in 1978 the Congressional Budget Office estimates an effective top tax rate of 25 percent on capital gains compared to 22 percent in the late 1970s and rates of 14 percent in the early 1980s. Table 1 lists the most significant changes over this period<sup>13</sup>.

Figure 1 plots the maximum rates on dividend income and capital gains incomes over the period 1962-1988. This figure provides a graphical illustration of the ordering of tax regimes. We choose the maximum rates as our primary focus since as is well known, the primary recipients of capital gains incomes are concentrated in upper income earners. For 1982 the behavior of the very top rate is a deceptive measure of the behavior of the tax treatment of dividends for high income earners because the tax reductions of 1981 *disproportionately* favor those with incomes over \$215,400. The rankings were adjusted slightly to account for this.<sup>14</sup> Otherwise, the tax regimes are clearly ranked. It is important to note that in ranking years from "most favorable to dividends" to "least favorable to dividends" we have assumed that inflation affects dividend income and capital gains tax income equally. With a non-indexed Federal Tax code (as was the case through the high inflation period of the 1970s) bracket creep adversely affects the tax treatment of dividends. Since capital gains taxes are levied on nominal capital gains, inflation also adversely affects the tax treatment of capital gains. We implicitly assume that the effect of inflation on the *differential* tax treatment of dividends and capital gains is insignificant. The ranking of years by tax regime is presented in Table 2.

## 5. Description of the Non-parametric Tests.

The generic signalling model does not predict a particular functional relationship between firm type and signal strength (here, firm value and tax regime, holding dividend yield constant).<sup>15</sup> The sole prediction is that of a

-----  
<sup>13</sup> All rates quoted are for married couples.

<sup>14</sup> Alternative rankings of this tax regime, including dropping it from the analysis, did not affect the results.

<sup>15</sup> For instance, a simple linear regression is, in fact, an inappropriate way to



monotonic relationship between type and signal strength, so a direct non-parametric test of this monotonicity condition is appropriate.

Even ignoring functional form concerns, it is no easier to interpret the results from a time series regression. Using a different dummy variable for each tax regime, one is left with determining whether the signs on the dummies are consistent with signalling theory: one must determine whether the signs have the desired monotonic relationship. Thus, even after imposing functional form, one is still left with a test of rank.

An additional concern is that, to implement a test of the monotonicity condition, one must control for the effect of differences in dividend yields across firms since the theory predicts that expected return is an increasing function of dividend yield.<sup>16</sup> Any methodology that does not separate out portfolios according to their dividend yield implicitly imposes a linear relationship between dividend yield and return. One could imagine forming portfolios sorted by dividend yield for each announcement date. But then the beta for each portfolio would have to be estimated since the resulting portfolios would be too small to be assumed well diversified. In contrast, the direct tests proposed here can easily control for dividend yield across large portfolios and allow for testing of the model without imposing unnecessary, and potentially false, parametric restrictions.

We propose two non-parametric tests that may be used to test the signalling theory of dividends. Kendall's  $\tau$  calculates an estimate of the correlation between the ranks of tax type and the level of the signalling variable (excess return). Kendall's distribution-free test for independence (K), is based on Kendall's  $\tau$ . This test examines the hypothesis that X,Y variables of a bivariate population are independent. The test is designed to detect a class of alternatives associated with either positive or negative values of  $\tau$ . The second test we examine is Heoffding's distribution-free test for independence (D). This test examines the hypothesis that X,Y variables of

-----  
test signalling theory, since it perforce fits a linear relationship on the data when the true relationship may be non-linear.

<sup>16</sup>Implicitly this suggests problems with interpretations of the standard event study which regresses excess return on dividend yield, but fails to control for tax regime. Systematic co-variation in dividend yield and tax regime over time can lead to 'spurious' signalling findings.

a bivariate population are independent. The test is designed to detect a much broader class of alternatives than Kendall's K and unlike K it is consistent when tau is zero and the null distribution is false. These tests can be found in Hollander and Wolfe (1973).

### 5.1 Kendall's Tau and Kendall's Distribution Free Test for Independence.

The advantage of Kendall's tau is that its distribution approaches the normal distribution quite rapidly. Thus, the normal approximation is better for this statistic than for others of its type such as Spearman's rho.

The statistic is calculated as follows. Assume that the data consist of a bivariate random sample, (X,Y), of size n. Define as concordant two observation pairs if both members of one observation are larger than the respective members of the other observation pair, for example (1, 3), (2, 4). Let  $N_c$  denote the number of concordant pairs out of the total  $\binom{n}{2} = n(n-1)/2$  possible pairs. Let  $N_d$  denote the remaining pairs (the number of discordant pairs, for example (4, 1) and (2, 3)). Kendall's tau is calculated as  $\tau = \frac{N_c - N_d}{n(n-1)/2}$ .<sup>17</sup> The hypothesis that we desire to test is the one-tailed test for positive association since the monotonicity hypothesis implies a positive relationship between the relative tax disadvantage of dividends (our X series) and the excess return associated with any given level of dividend yield (our Y series). Thus, the null ( $\tau = 0$ ) and (one-sided) alternative hypotheses to be tested can be written as:

$H_0$ : X and Y are mutually independent.

$H_1$ : there is a tendency for the larger values of X to be paired with the larger values of Y.

A test based simply on  $N_c - N_d$ , Kendall's distribution-free test for independence has wider usage. This test statistic is based upon the null hypothesis of mutual independence. Formally:

---

<sup>17</sup>Thus, tau measures whether there are more discordant or concordant pairs. With two perfectly positively correlated variables, all pairs are concordant and  $\tau = 1$ . With two perfectly negatively correlated series, all pairs are discordant and  $\tau = -1$ . With two independent series, the expected number of concordant and discordant pairs is identical so that the expected value of  $\tau$  is 0.

$$H_0: P(X \leq a \text{ and } Y \leq b) = P(X \leq a)P(Y \leq b) \quad \forall a, b.$$

The statistic used to test this hypothesis is  $K$ , where  $K$  is defined in the following way:

1. For  $1 \leq i \leq j \leq n$  calculate  $\zeta(X_i, X_j, Y_i, Y_j)$ ,

$$\text{where } \zeta(a, b, c, d) = \begin{cases} +1 & \text{if } (a-c)(b-d) > 0 \\ -1 & \text{if } (a-c)(b-d) < 0. \end{cases}$$

2. Set  $K = \sum_{i=1}^n \sum_{j=1}^n \zeta(X_i, X_j, Y_i, Y_j)$ .

3. For a one-sided test of the null hypothesis versus the alternative hypothesis, for example,  $\tau > 0$ , the test at the  $\alpha$  level of significance would be

$$\text{reject } H_0 \quad \text{if } K \geq k(\alpha, n)$$

$$\text{accept } H_0 \quad \text{if } K < k(\alpha, n),$$

where the constant  $k(\alpha, n)$  satisfies  $P_0[ K \geq k(\alpha, n) ] = \alpha$ , and  $K = N_c - N_d$ .

The large sample approximation of the Kendall  $K$  statistic is given by

$$KL = \frac{K - E_0(K)}{[\text{var}_0(K)]^{1/2}} = \frac{K}{[n(n-1)(2n+5)/18]^{1/2}}.$$

When  $H_0$  is true the test statistic  $KL$  has an asymptotic  $N(0,1)$  distribution. The Normal approximation to the finite sample test would be

$$\text{reject } H_0 \quad \text{if } KL \geq z(\alpha)$$

$$\text{accept } H_0 \quad \text{if } KL < z(\alpha).$$

## 5.2 Heoffding's Distribution-Free Test for Independence.

Since we are concerned with examining the data in the context of a one-tailed test for positive rank order correlation we use this test primarily to verify the results based on Kendall's  $K$  (since Heoffding's test cannot distinguish between positive and negative rank order correlation). Since pooling equilibria result in a prediction of  $\tau$  equal to zero, we use this test

to check for alternatives of dependence when  $\tau$  is equal to zero (recall that Kendall's K is inconsistent if  $\tau = 0$ ).

To test the hypothesis that the random variables X and Y are independent, namely that

$$P[X \leq x \text{ and } Y \leq y] = P[X \leq x]P[Y \leq y] \quad \forall x, y$$

we make the same assumptions as for Kendall's K and construct the test statistic of the null hypothesis of independence as follows,

1. Rank  $X_1, X_2, \dots, X_n$  jointly and let  $r_i$  denote the rank of  $X_i$  in this joint ranking,  $i = 1, 2, \dots, n$ .<sup>18</sup>
2. Rank  $Y_1, Y_2, \dots, Y_n$  jointly and let  $s_i$  denote the rank of  $Y_i$  in this joint ranking,  $i = 1, 2, \dots, n$ .
3. Let  $c_i$  denote the number of sample pairs  $(X_\alpha, Y_\alpha)$  for which both  $X_i < X_\alpha$  and  $Y_i < Y_\alpha$ .
4. Set  $Q = \sum_{i=1}^n (r_i - 1)(r_i - 2)(s_i - 1)(s_i - 2)$

$$R = \sum_{i=1}^n (r_i - 2)(s_i - 2)c_i$$

$$S = \sum_{i=1}^n c_i(c_i - 1).$$

The Heoffding D statistic is

$$D = \frac{Q - 2(n-2)R + (n-2)(n-3)S}{n(n-1)(n-2)(n-3)(n-4)}.$$

5. For a two sided alternative versus the alternative that X and Y are dependent<sup>19</sup>, at the  $\alpha$  level of significance

<sup>18</sup>Since the X series is the tax regime, a qualitative ranking, the ranking r is simply the ranking R from table 2.

<sup>19</sup>The D statistic tests against a broad range of alternatives. Note in particular that D tests against alternatives where the X's and Y's are positively associated and alternatives where the X's and Y's are negatively associated. Unlike  $\tau$ , D does not distinguish between discordance and concordance; only 2-tailed tests are appropriate. See Hollander and Wolfe (1973) or Heoffding (1948) for more details.

reject  $H_0$  if  $D \geq d(\alpha, n)$

accept  $H_0$  if  $D < d(\alpha, n)$ .

Here,  $d$  is a constant which satisfies the equation  $P_0[D \geq d(\alpha, n)] = \alpha$ . Values of  $d$  and  $\alpha$  for  $n = 5, 6, 7, 8$  and  $9$  are given in Hollander and Wolfe (1973). The large sample approximation to the  $D$  statistic is given by  $nD + (1/36)$ ;  $p$ -values for this distribution are in Hollander and Wolfe.

## 6 Data.

We test for the monotonic relationship between tax rates and excess returns predicted by dividend signalling models using American stock market information provided by the Center for Research in Stock Prices (CRSP). Information on stock returns, firm value, and cash disbursement distribution information, data for price, shares outstanding and all dividend distribution information was obtained from the CRSP monthly master file and the CRSP daily returns file was used to obtain stock return information. The period of analysis begins in July 1962 when daily returns were first collected.

For a firm to be considered part of the sample it had to meet the following criteria:

- (1) The firm had to be listed on the New York Stock Exchange as of July 1962 or later.
- (2) Firms are only considered over the period when they make regular quarterly cash dividends.<sup>20</sup>
- (3) A complete set of price, dividend distribution and return information was available for the declaration date of the dividend.

For each event (declaration of a dividend) occurring at time  $t$ , we calculate both firm size and dividend yield.<sup>21</sup> In constructing the dividend

---

<sup>20</sup>For the majority of firms in the sample their cash dividend disbursement pattern was a quarterly dividend. In addition year-end "extra" dividends for these firms were included.

<sup>21</sup>The dividend yield measure employed is a short-term measure (one-day return) that takes account of dividend size but not dividend timing. This biases it in favor of finding tax-related effects. For our purposes this is preferable to

yield and firm size variables, it is important to note that since the distribution information is provided by the monthly master file, the price and shares outstanding information are available only for the last trading day in each month. However, dividend declaration dates and the dollar amount of the dividends are available for the actual event date within an event month. To take account of the fact that for any event occurring in month  $t$ , an investor's information set would only contain information known at  $t-1$ , firm size and dividend yield are computed using month  $t-1$  price data. Thus, dividend yield is defined as the dollar amount of the cash dividend divided by the price in the month prior to the event month, and firm size is defined as the prior month price times the number of shares outstanding.

In investigating the monotonic relationship between tax regimes and excess return we separately control for any other variable that may impact on excess return. We therefore construct portfolios categorized by dividend yield and firm size. Our prediction is that *for any level of dividend yield* the information released should be more favorable the more disadvantageous the tax treatment of dividends. We therefore clearly need to control for variations in dividend yield. In addition, there are well-documented intertemporal variations in average dividend yields for which we wish to control. The importance of firm size is well documented in studies of asset pricing (see Keim (1985) or Bajaj and Vijh (1990)).<sup>22</sup>

For each year, therefore, the total number of events for all firms in the sample were categorized based on the size of the calculated dividend yield. In preliminary work we experimented with various grid sizes.<sup>23</sup> All of our reported results are for the dividend yield groupings increasing in increments of 0.5%. Two considerations led us to choose this dividend yield grouping. First, find the vast majority of quarterly dividend yields are below 2%. Second, in constructing excess returns for each dividend yield portfolio we

-----  
a long-term measure that is biased against finding tax effects (see Rumsey (1988) and Kalay and Michaely (1992) for a discussion of timing effects and measurement of tax effects of dividends).

<sup>22</sup>Also, it is possible that the information released may be a function of firm size (e.g. analysts reports may reveal more information about large firms than small firms, requiring less information signalling for these firms).

<sup>23</sup>Dividend yield divisions in increments of 0.2% and 0.3% were examined. No substantive difference in results was found.

follow the methodology of Brown and Warner (1980) and assume that each portfolio is sufficiently large that it is well diversified (so that its beta is constant over time). Equally important, to the extent that there is heterogeneity in the amount of public information about firms within a year, aggregation into large portfolios permits 'laws of large number' arguments that equal dividend yield portfolios are 'informationally' identical over time. Based on these considerations, we create five portfolios based on dividend yield size increments of 0.5%:

Portfolio A:	$0 < dy < 0.5 \%$
Portfolio B:	$0.5 \leq dy < 1.0 \%$
Portfolio C:	$1.0 \leq dy < 1.5 \%$
Portfolio D:	$1.5 \leq dy < 2.0 \%$
Portfolio E:	$dy \geq 2.0 \%$

For all firms, the dividend distribution events for each year are then categorized based on these dividend increments. Each firm event is then assigned to one of the portfolios as above. We then calculate for each dividend yield portfolio (A through E) the excess returns for each year 1962 through 1988. For each event documented in each dividend yield portfolio, the associated daily stock return for that event date is recorded. The average daily return for each dividend yield portfolio is then calculated. This average daily return for the event date is converted into an annual return and the annual return on the market portfolio is then subtracted to give us the dividend yield portfolio's annual excess return. The market portfolio is characterized as the value-weighted portfolio of all stocks listed on the NYSE as supplied by CRSP. The non-parametric tests were run using these complete dividend yield portfolio's excess returns. For the high dividend yield portfolio, E, for many of the early years of our study the number of firms paying such large dividends was too small to be sure that the portfolio would be well diversified. Hence the number of tax regimes considered for portfolio E is smaller than for portfolios A through D.

We also control for possible size effects by sub-dividing dividend yield portfolios A through E on the basis of firm size. This controls both for the standard size effects and for any systematic differences in public information across firms of different sizes (for instance, there may be less

public information about small firms so that more information is revealed through dividends). For each year, the portfolios were ranked with respect to firm size and then split into three separate (but equal) size groups, large (L), medium (M) and small (S). For each of these new portfolios, the annual excess return was calculated in the same manner as with the undivided dividend yield portfolios. The non-parametric tests were run on these size-based dividend portfolios using the calculated annual excess returns.

Many studies have found a relationship between dividend yield and excess return and interpreted these results as evidence of tax effects resulting for the differential treatment of dividends and capital gains (see Litzenberger and Ramaswamy 1979). These results are generally derived from estimates drawn from cross-sectional analysis which are aggregated over time. This time aggregation ignores the possibility that the yield-return relationship may vary through time due to changes in the tax regime. However, signalling theory predicts that the strength of the relationship between stock returns and dividend yields varies directly with the extent of the tax disadvantage of dividends. Time aggregation across tax regimes can therefore bias the results.

Recall too, that although this investigation is posed as a test of information-signalling models, that tax-based CAPM models provide the same predictions. Hence, a failure to find the monotonic relationship provides strong evidence against the tax-effect theories which suggest that investors demand compensation in the form of higher pre-tax returns on high dividend stocks to compensate them for the tax cost of dividends.

## **7. Results**

Table 3 summarizes the results for the tests of the theory for the complete portfolios grouped by dividend yield and table 4 presents the corresponding results for the portfolios split by both dividend yield and firm size. Looking first at table 3, the monotonicity prediction that we wish to test implies that there should be concordance between the excess returns and the relative tax disadvantage of dividend income. We can see from the estimate for tau of rank correlation that there are as many discordant as



concordant pairs<sup>24</sup> and only for portfolio A may we reject the null hypothesis of independence based on Kendall's distribution free test statistic for independence (K). However, note that while we reject independence for portfolio A, the indication is that there is a *negative* association between tax regime and excess return for this portfolio, and *not* the *positive* correlation that signalling theory predicts! The large sample approximation of Kendall's K statistic, (KL), is also significant at the 5% level for this portfolio. Heoffding's distribution free test for independence (D) shows no significance for any dividend yield group and so according to this test, we cannot reject the null hypothesis of independence for any portfolio.

Table 4 presents results for the size-controlled dividend yield portfolios. Only for portfolio (A-S), the smallest firms paying dividends between 0% and 0.5%, do we reject independence based on Kendall's  $\tau$  at the 5% level. For portfolios B-S and E-S (the smallest firms paying dividends between 0.5% and 1% and over 2%, respectively) we reject independence at the 10% level. The result for A-S is consistent with table 3 where portfolio A was the only portfolio showing significant discordance. Recall that discordance is *not* consistent with the signalling hypothesis which is being tested. Again there are as many negative values as positive values for our estimates of  $\tau$ . Heoffding's test statistic D, shows no significance for any of the portfolios in the table. Recall that unlike Kendall's K, Heoffding's D statistic is consistent when  $\tau$  is zero and the null distribution is false. Examining table 4 it is clear that many of our estimates for  $\tau$  are very close to zero. Based on these results, we cannot reject the null hypothesis of independence.<sup>25</sup>

In summary, we find no evidence of a positive association between excess return and the relative tax treatment of dividends.<sup>26</sup> Heoffding's D does not

-----  
<sup>24</sup>Intuitively, if these series are truly independent, one would expect that in addition to finding no significance, one would also find an equal number of positive and negative test statistics. While this adds no formal power to the test results, this finding of symmetry around zero might make one more confident than if for example, we had found all the test statistics insignificant but positive.

<sup>25</sup>Values of Spellmans' rho for each portfolio were also calculated. These produced identical levels of significance to those presented for Kendall's tau and hence are omitted.

<sup>26</sup>We also considered the possibility that the effective capital gains tax is

reject independence for any of the portfolios considered and Kendall's  $\tau$  finds evidence of significant concordance for none of the portfolios (while finding discordance for one aggregated and two disaggregated portfolios). (Statistically insignificant) discordance is as common as (statistically insignificant) concordance looking across the set of portfolio estimates.

## 8. Conclusions

Bagwell and Shoven (1989) estimate that \$68 billion in cash dividends were paid in 1985. The issue addressing researchers is why, given the apparently high associated tax costs, are dividends issued? One can always postulate that, *ceteris paribus*, certain investors have a preference for dividends over an identical dollar amount of capital gains, but such relative preferences would have to be extreme in light of the tax costs. It is also hard to believe that dividends are really irrelevant given the enormous resources that firms devote to determining their dividend policy.

This paper tests whether the underlying explanation for dividends is signalling based. We show a common prediction of all (scalar or vector) dividend signalling models is that of a positive rank order correlation between the tax disadvantage of dividends relative to capital gains and the amount of "good" news revealed for any given level of dividend payout.

We present tests of this monotonicity prediction using data on dividend yield and excess returns for American stocks for the time period July 1962 to December 1988. Over this period we detail sixteen distinct tax regimes, ordered according to the relative tax disadvantage of dividends. Constructing portfolios ranked by dividend yield and size we test whether there is any positive association between the relative tax disadvantage of dividends and the excess returns associated with any level of dividend payout. Using distribution-free tests for independence we find no evidence of the predicted positive monotonic relationship.

Our failure to reject the independence of tax regime and excess returns

-----  
zero due to dynamic tax shielding strategies. The results are almost identical to those presented here: portfolios A and A-S still have significant discordance at the 5% level and portfolios C-M and E-S have significant concordance at the 10% level. No other portfolios exhibited a significant monotonic relationship between excess returns and dividend tax rates.

for any given dividend yield implies that we cannot find any evidence in support of the signalling theory of dividends. Because we test only the weakest signalling prediction -- monotonicity, we provide strong evidence that if there is information content in dividends, then the information provided by dividends is independent of the marginal cost of using dividends as a signal. This result is inconsistent with any tax-based model of dividend signalling, and more generally with any dividend signalling model *provided* that the marginal investor is taxed. One can view our findings as indirect support for Dybvig and Zender (1991) who show that if one endogenizes the form of managerial reward scheme within the context of many of these models, then the optimal managerial reward scheme is such that no signalling occurs in equilibrium. Finally, it is important to note that our findings are inconsistent with tax-based CAPM arguments. Investors do not appear to demand compensation in the form of higher pre-tax returns on high dividend stocks to compensate them for the tax cost of dividends.

It is also important to stress that the paper does not find that *no* information is revealed through dividend announcements. Indeed, the evidence of positive excess returns associated with greater dividend announcements is indicative of information release. Rather, the results reveal that information release is an indirect by-product of dividend announcements instead of a direct signalling goal. By looking at the relationship between excess returns and the marginal tax cost of dividends we distinguish between signalling explanations and indirect information release. This distinction is only possible because we look at the marginal tax side, rather than looking more directly at the relationship between dividend yield and excess return. The information content of dividends is uncorrelated with the tax costs of dividends, and hence inconsistent with signalling.

Such indirect information release is consistent with agency models of dividends in which dividends help resolve agency problems in the firm (greater dividends reveal more "free cash"). To our knowledge the analysis of Lang and Litzenberger (1991) is the only attempt so far to test an agency-based model of dividends. They compare a cash flow signalling theory of dividends with Jensen's (1986) "free cash flow" theory of dividends (an agency theory of dividends) and find weak evidence supportive of the existence of agency problems arising from inefficient use of free cash flow.

TABLE 1

*Major tax changes affecting capital gains and dividend income<sup>a</sup>  
(Income tax rates quoted are for married couples)*

Year(s)	Income Tax Changes.	Inclusion Rate	Alternate Maximum Rate	Holding Period (mths)
1962/63	Top rate = 90%	50%	25%	6
1964	Rates lowered, top rate 77%.	50%	25%	6
1965/66/67	Rates lowered, top rate 70%	50%	25%	6
1968	Tax surcharge of 7.5%	50%	25%	6
1969	Tax surcharge of 10%.	50%	25%	6
1970	Tax surcharge of 2.5%	50%	29.5%	6
1971	No changes	50%	32.5% <sup>b</sup>	6
1972/76.	No major changes	50%	None	9
1977/78.	No major changes	50%	None	12
1979/80	No major changes	60%	None	12
1981	Rates lowered 5%	60%	None	12
1982	Top rates cut to 50% from 69%. Other rates lowered by 10%.	60%	None	12
1983	Rates lowered 10%	60%	None	12
1984	Rates lowered	60%	None	6
1985/86.	No major changes, some bracket adjustments.	60%	None	6
1987	Lower rates, reduced number of brackets.	100%	28%	6
1988	Lower rates.	100%	None	6

a. Income tax data from tables A-3 to A-6 of Pechman (1987), updated to 1988 from *Standard Federal Tax Reports, Commerce Clearing House Inc.* (1988). Capital gains tax treatment obtained from *Standard Federal Tax Reports, Commerce Clearing House Inc.* (1962-1988).

b With \$50,000 cap on alternate maximum rate shield. All capital gains over \$50,000 per individual taxed at 50% of regular marginal rate.

**TABLE 2**

*Rankings from most favorable to dividends  $R_1$  to least favorable  $R_{16}$ <sup>a</sup>.*

$R_1$	1988
$R_2$	1987
$R_3$	1985-86
$R_4$	1984
$R_5$	1983
$R_6$	1982
$R_7$	1972-78
$R_8$	1979-80
$R_9$	1981
$R_{10}$	1965-67
$R_{11}$	1971
$R_{12}$	1970
$R_{13}$	1969
$R_{14}$	1968
$R_{15}$	1964
$R_{16}$	1962-63

a.  $R_j$  denotes the  $j$ th most favorable difference in tax rates between dividends and capital gains (for example in 1988 this difference is zero, in 1962-1963 for the highest tax bracket, this difference is 65% (90% on dividend income versus 25% on capital gains)). See figure 1.

Table 3

Non-Parametric Test Statistics for the  
Undivided Sample

X = TAX REGIME RANKING

Y = EXCESS RETURN

	n	$\hat{\tau}$	K	KL	D	$nD + (1/36)$
A	16	-0.4167	-50	-2.25 †	0.004	0.0981
B	16	-0.1833	-22	-0.99	0.001	0.0481
C	16	0.133	16	0.72	-0.001	0.0097
D	16	0.1833	22	0.99	-0.001	0.143
E	11	0.2	11	0.8563	-0.0008	0.0157

† denotes significance at the  $\alpha = 0.05$  level.

Key for Tables 3 and 4.

A - E represents portfolios with lowest (A) to highest (E) dividend yield.

S, M, L denote firm sizes small, medium, large respectively.

n is the number of tax regimes over the period.

$\hat{\tau}$  is Kendall's tau statistic.

K is Kendall's K statistic.

KL is the large sample approximation to Kendall's K.

D is Heoffding's D statistic.

$nD + 1/36$  is the large sample approximation to D.

Table 4.

Non-Parametric Test Statistic for Portfolios  
Divided by Firm Size

X = TAX REGIME RANKING

Y = EXCESS RETURN

	n	$\hat{\tau}$	K	KL	D	$nD+(1/36)$
A-L	16	-0.2167	-26	-1.1706	0.0007	0.0397
A-M	16	-0.0833	-10	-0.4502	0.0008	0.0417
A-S	16	-0.417	-50	-2.251 †	0.0034	0.0818
B-L	16	-0.0667	-8	-0.3602	0.0023	0.065
B-M	16	0.0	0	0.0	-0.0005	0.0203
B-S	16	-0.2667	-32	-1.4407 ★	0.0001	0.0278
C-L	16	-0.0167	-2	-0.0900	-0.0006	0.0187
C-M	16	0.2	24	1.0805	-0.0003	0.0233
C-S	16	0.0667	8	0.3602	-0.0010	0.0113
D-L	16	0.1	12	0.5403	0.0002	0.0305
D-M	16	0.1167	20	0.9005	0.0010	0.0430
D-S	16	0.2	24	1.0805	0.0012	0.0463
E-L	11	0.1636	9	0.7006	-0.0012	0.0082
E-M	11	0.3091	17	1.323	0.0007	0.0387
E-S	11	0.4545	25	1.9462 ★	0.0046	0.1017

† denotes significance at the  $\alpha = 0.05$  level.

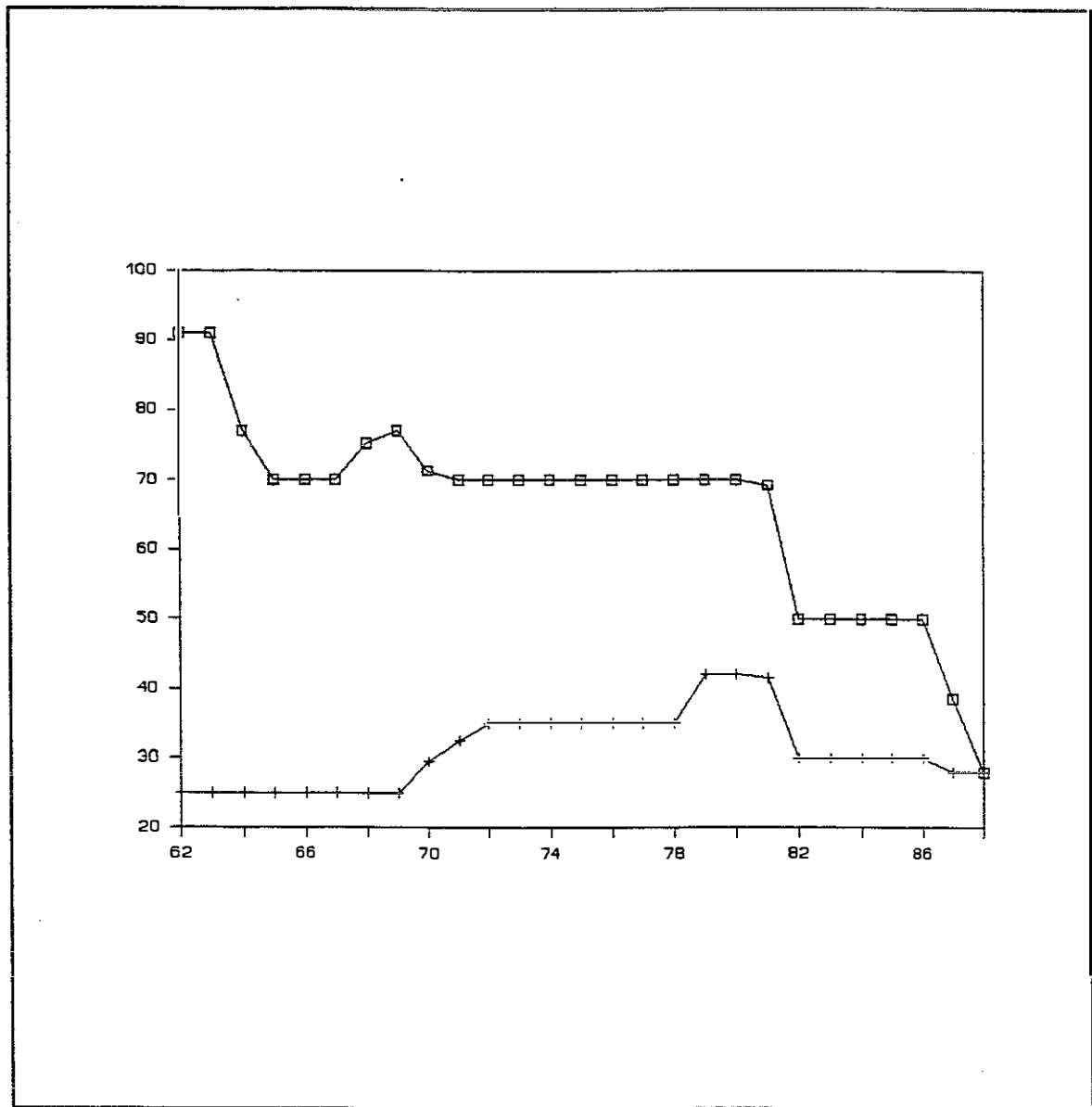
★ denotes significance at the  $\alpha = 0.1$  level.

FIGURE ONE

Maximum rates on capital gains and dividend income 1962-1988

□ = maximum rate on dividend (regular) income.

+ = maximum rate on capital gains income.





## Bibliography

- Ahrony, J., and I. Swary, (1980) "Quarterly Dividend and Earnings Announcements and Stockholder Returns: An Empirical Analysis." *Journal of Finance* 35: 1-12.
- Ambirish, R., K. John, and J. Williams, (1987) "Efficient Signalling with Dividends and Investments." *Journal of Finance* 42: 321-343.
- Ang, J.S., (1975) "Dividend Policy: Informational Content or Partial Adjustment?" *Review of Economics and Statistics* 57: 65-70.
- Asquith, P., and D. Mullins, (1983) "The Impact of Initiating Dividend Payments on Shareholders' Wealth" *Journal of Business* 56: 77-96.
- Auerbach, A.J., (1988) "Capital Gains Taxation in the US: Realizations, Revenue and Rhetoric. *Brookings Papers on Economic Activity* 2.
- Bagwell, L., and J. Shoven, (1989) "Cash Distributions to Shareholders." *Journal of Economic Perspectives*: 129-140.
- Bajaj, M., and A. Vijh, (1990) "Dividend Clienteles and the Information Content of Dividend Changes." *Journal of Financial Economics* 26: 193-219.
- Banks, J., and J. Sobel, (1987) "Equilibrium Selection in Signalling Games." *Econometrica*: 647-661.
- Bar-Yosef, S., and L. Huffman, (1986) "The Information Content of Dividends." *Journal of Financial and Quantitative Analysis* 21: 47-58.
- Bernheim, B.D., (1991) "Tax Policy and the Dividend Puzzle." *RAND Journal of Economics* 22: 455-476.
- Bhattacharya, S. (1979) "Imperfect Information, Dividend Policy and the 'Bird in the Hand' Fallacy" *Bell Journal of Economics* 10: 259-270.
- Bhattacharya, S. (1980) "Nondissipative Signalling Structures and Dividend Policy." *Quarterly Journal of Economics* 95: 1-24.
- Brickley, J., (1983) "Shareholder Wealth, Informational Signalling and the Specially Designated Dividend: An Empirical Study." *Journal of Financial Economics* 12: 187-210.
- Brennan, M. (1970) "Taxes, Market Valuation, and Corporate Financial Policy." *National Tax Journal* 23: 417-427.
- Brown, S.J., and J.B. Warner, (1980) "Measuring Security Price Performance." *Journal of Financial Economics* 8: 205-258.
- Charest, G., (1978) "Dividend Information, Stock Returns and Market Efficiency - II." *Journal of Financial Economics* 6: 297-330.
- Cho, I-K., and D. Kreps, (1987) "Signalling Games and Stable Equilibria." *Quarterly Journal of Economics* 102: 179-221.
- Christie, W.G., and R. Huang, (1992) "The Changing Functional Relation Between Stock Returns and Dividend Yields." *mimeo* , Vanderbilt University.
- Commerce Clearing House Inc, (1962-88). **Standard Federal Tax Reports.**
- Dybvig, P., and J. Zender, (1991) "Capital Structure and Dividend Policy with Asymmetric Information." *Review of Financial Studies* 4: 201-219.
- Eades, K., (1982) "Empirical Evidence on Dividends as a Signal of Firm

- Quality." *Journal of Financial and Quantitative Analysis* 17: 471-500.
- Engers, M., (1987) "Signalling with Many Signals." *Econometrica* 55 663-674.
- Fama, E., Fisher, F., Jensen, M. and R. Roll, (1969)
- Ghosh, C., and J.R. Wooldridge, (1988) "An Analysis of Shareholder Reaction to Dividend Cuts and Omissions." *Journal of Financial Research* 9: 281-294.
- Gonedes, N.J., (1978) "Corporate Signalling, External Accounting and Capital Market Equilibrium: Evidence on Dividends, Income, and Extraordinary Items." *Journal of Accounting Research* 16: 26-79.
- Hakansson, N., (1982) "To Pay or Not to Pay Dividends." *Journal of Finance* 37: 415-428.
- Hollander, M., and D. Wolfe, (1973) *Nonparametric Statistical Methods* (Wiley).
- Jensen, M., (1986) "Agency Costs of Free Cash Flow, Corporate Finance, and Takeovers." *American Economic Review* 76: 313-329.
- John, K., and B. Mishra, (1990) "Information Content of Insider Trading Around Corporate Announcements: The Case of Capital Expenditures." *Journal of Finance* 45: 835-855.
- John, K., and L. Lang, (1991) "Insider Trading around Dividend Announcements: Theory and Evidence." *Journal of Finance* 46: 1361-1389.
- John, K., and J. Williams, (1985) "Dividends, Dilution and Taxes: A Signalling Equilibrium." *Journal of Finance* 40: 1053-1070.
- Kalay, A. (1980) "Signalling, Informational Content and the Reluctance to Cut Dividends." *Journal of Financial and Quantitative Analysis* 15: 855-865.
- Kalay, A. and U. Lowenstein, (1986) "the Informational Content of the Timing of Dividend Announcements." *Journal of Financial Economics* 16: 373-388.
- Kalay, A., and R. Michaely (1992) "Dividends and Taxes: A Re-examination." *mimeo*, Cornell University.
- Keim, D., (1983) "Size Related Anomalies and Stock Return Seasonality." *Journal of Financial Economics* 12: 13-32.
- Kumar, P., (1988) "Shareholder-Manager Conflict and the Information Content of Dividends." *Review of Financial Studies* 1: 111-136.
- Lang, L., and R. Litzenberger, (1989) "Dividend Announcements: Cash Flow Signalling vs Free Cash Flow Hypothesis?" *Journal of Financial Economics* 24: 181-191.
- Laub, P.M., (1976) "On the Informational Content of Dividends." *Journal of Business* 49: 73-80.
- Litzenberger, R., and K. Ramaswamy, (1979) "The Effect of Personal Taxes and Dividends on Capital Asset Prices: Theory and Empirical Evidence." *Journal of Financial Economics* 7: 163-195.
- Litzenberger, R., and K. Ramaswamy, (1980) "Dividends, Short Selling Restrictions Tax Induced Investor Clienteles and Market Equilibrium." *Journal of Finance* 35: 469-482.
- Litzenberger, R., and K. Ramaswamy, (1982) "The Effect of Dividends on Common Stock Prices: Tax Effects or Information Effects." *Journal of Finance* 37: 429-444.
- Mailath, G., (1987) "Incentive Compatibility in Signalling Games with a

- Continuum of Types." *Econometrica* 55: 1349-1365.
- Miller, M. and F. Modigliani, (1961) "Dividend Policy, Growth and the Valuation of Shares." *Journal of Business* 4: 411-433.
- Miller, M., and K. Rock, (1985) "Dividend Policy Under Asymmetric Information." *Journal of Finance* 40: 1031-1051.
- Miller, M., and M. Scholes, (1978) "Dividends and Taxes" *Journal of Financial Economics* 6: 333-364.
- Modigliani, F. and M. Miller, (1958) "The Cost of Capital, Corporation Finance and the Theory of Investment." *American Economic Review* 48: 261-297.
- Ofer, A., and A. Thakor, (1987) "A Theory of Stock Price Responses to Alternative Corporate Cash Disbursement Methods: Stock Repurchases and Dividends." *Journal of Finance* 42: 365-394.
- Patell, J., and H. Wolfson, (1984) "The Intra-day Speed of Adjustment of Stock Prices to Earnings and Dividend Announcements." *Journal of Financial Economics* 13: 223-252.
- Pechman, J., (1987) **Federal Tax Policy** (5th Ed.) Brookings Institution.
- Penman, S. (1983) "The Predictive Content of Earnings Forecasts and Dividends." *Journal of Finance* 38: 1181-1199.
- Peterson, P., D. Peterson and J. Ang (1985) "Direct Evidence on the Marginal Rate of Taxation on Dividend Income" *Journal of Financial Economics* 14: 267-282.
- Pettit, R., (1972) "Dividend Announcements, Security Performance, and Capital Market Efficiency." *Journal of Finance* 27: 993-1001.
- Pettit, R., (1976) "The Impact of Dividend and Earnings Announcements: A Reconciliation." *Journal of Business* 49: 86-96.
- Riley, J., (1979) "Informational Equilibrium." *Econometrica* 47: 331-358.
- Ross, S., (1977) "The Determination of Financial Structure: The Incentive-Signalling Approach." *Bell Journal of Economics* 1: 23-40.
- Rumsey, J., (1989) "Testing for Tax Effects of Dividend Yields on Pre-Tax Returns." *mimeo*, York University.
- Spence, M., (1973) "Job Market Signalling." *Quarterly Journal of Economics* 87: 355-374.
- Talmor, E., (1981) "Asymmetric Information, Signalling, and Optimal Corporate Financial Decisions." *Journal of Financial and Quantitative Analysis* 16: 413-435.
- Watts, R., (1973) "The Informational Content of Dividends." *Journal of Business* 46: 191-211.
- Watts, R., (1978) Systematic 'Abnormal' Returns after Quarterly Earning Announcements." *Journal of Financial Economics* 6: 127-150.
- Williams, J., (1988) "Efficient Signalling with Dividends, Investment, and Stock Repurchases." *Journal of Finance* 43: 737-747.